

[54] **PROCESS FOR NITROGEN OXIDES
REDUCTION AND MINIMIZATION OF THE
PRODUCTION OF OTHER POLLUTANTS**

[75] Inventors: William R. Epperly, New Canaan;
James C. Sullivan, Norwalk; Barry
N. Sprague, Bethlehem; John H.
O'Leary, Danbury, all of Conn.

[73] Assignee: Fuel Tech, Inc., Stamford, Conn.

[*] Notice: The portion of the term of this patent
subsequent to Oct. 25, 2005 has been
disclaimed.

[21] Appl. No.: 411,902

[22] PCT Filed: Aug. 12, 1988

[86] PCT No.: PCT/US88/02751

§ 371 Date: May 23, 1989

§ 102(e) Date: May 23, 1989

[87] PCT Pub. No.: WO89/02781

PCT Pub. Date: Apr. 6, 1989

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 50,198, May 14, 1987,
Pat. No. 4,780,289, and Ser. No. 14,431, Feb. 13, 1987,
Pat. No. 4,770,863, and Ser. No. 22,799, Mar. 6, 1987,
abandoned, and Ser. No. 25,350, Mar. 13, 1987, and
Ser. No. 25,493, Mar. 13, 1987, abandoned, and Ser.
No. 39,013, Apr. 15, 1987, Pat. No. 4,803,059, and Ser.
No. 100,128, Sep. 23, 1987, and Ser. No. 108,779, Oct.
14, 1987, and Ser. No. 132,801, Dec. 14, 1987, Pat. No.
4,803,839, and Ser. No. 155,864, Feb. 29, 1988, and a
continuation-in-part of Ser. No. 207,292, Jun. 15, 1988.

[51] Int. Cl.⁵ C01B 21/00; B01J 8/00

[52] U.S. Cl. 423/235; 423/239

[58] Field of Search 423/235, 235 D, 239,
423/239 A

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,801,696 4/1974 Mark .
3,846,981 11/1974 Paczkowski .
3,900,554 8/1975 Lyon .
4,080,423 3/1978 Smith et al. .
4,081,509 3/1978 Hishinuma et al. .
4,087,372 5/1978 Saitoh et al. .

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

2630202 2/1977 Fed. Rep. of Germany .
51-76166 7/1976 Japan .
51-104948 9/1976 Japan .
50-67669 12/1976 Japan .
5379762 12/1976 Japan .
51-1138 7/1977 Japan .
51-4588 7/1977 Japan .
51-12330 8/1977 Japan .
5189176 2/1978 Japan .
53-033975 3/1978 Japan .
52-42643 11/1978 Japan .
53-130274 11/1978 Japan .
54-38268 3/1979 Japan .
54-51986 4/1979 Japan .
54-72763 6/1979 Japan .
54-119370 9/1979 Japan .
54-123573 9/1979 Japan .
54-158371 12/1979 Japan .
55-44365 3/1980 Japan .
55-49130 4/1980 Japan .
57-190638 11/1982 Japan .
8702023 10/1986 PCT Int'l Appl. .

OTHER PUBLICATIONS

Muzio et al., "Gas Phase Decomposition of Nitric
Oxide in Combustion Products", Sixteenth Symposium
on Combustion, Cambridge, Mass. 1976, pp. 199-208.
Faucett et al., "Technical Assessment of NO_x Removal
Process for Utility Application", EPRI AF-568,
EPA/600/7-77/127, Nov. 1977, pp. 187-196.

Primary Examiner—Gregory A. Heller

Attorney, Agent, or Firm—St. Onge Steward Johnston &
Reens

[57] **ABSTRACT**

A process for the reduction of nitrogen oxides in an
effluent from the combustion of a carbonaceous fuel
while minimizing the production of other pollutants is
presented. The process comprises introducing (most
commonly by injecting) a nitrogen oxides reducing
treatment agent into an effluent according to a nitrogen
oxides reducing treatment regimen under conditions
such that the treatment agent is operating on the high
temperature or right side of its nitrogen oxides reduc-
tion versus effluent temperature curve, especially on the
high temperature or right side of the curve plateau.

42 Claims, 10 Drawing Sheets